Reclaim Water for Irrigation Project

Terranova West MUD

June 2025

Overview

It had long been the vision of the Board to improve upon irrigating common areas with expensive treated water. The NHCRWA reclaim irrigation project incentive program gave the District the opportunity to explore the possibility but, without a waste treatment plant of our own, and the BAMMEL (Olde Oaks) waste treatment plant being too far south of the District to cost effectively build a reclaim water from the treatment plant back to the District, how best to do that? The answer lay just north of the District with our sister MUD, BILMA's (Spring Creek Oaks) waste treatment plant. In a joint Board meeting three years ago our Board proposed a joint, shared cost, project to modify the BILMA waste treatment plant to add a separate reclaim irrigation treatment facility to meet TCEQ standards for reclaim irrigation. BILMA would take the lead on the waste treatment plant upgrade design and construction. The cost of laying the main reclaim water line within each District would be the responsibility of each District and therein the project was born. Each District separately applied for, and was granted, project approval with the NHCRWA.

Executive Summary

Background Information

The District and the Terranova West MUD Property Owners Association within the District were, combined, using approximately 7-7.8 million gallons of treated water annually to irrigate common areas with the District using 15, mechanical, off the shelf (purchased at irrigation supply or hardware stores), standard, irrigation controllers to manage the areas.

Project Purpose

The purpose of the project was to not only eliminate using treated water for irrigation, but to do so using only five, integrated, remotely monitored, smart controllers using AI technology to manage the system and to incorporate addition common areas not previously cost effective to irrigate with treated water, using fewer gallons to do so, and taking fewer manhours to manage it all.

The fifteen legacy, off the shelf (purchased at irrigation supply and or hardware stores), irrigation controllers to be replaced by the five smart controllers ranged in age from five to thirty years as well as all of the existing, standard PVC irrigation distribution lines to be replaced with new, reclaim identified, PVC lines.

Information on the District's Consultant, Equipment, Consultant Design Documents

Product/Equipment Information

During the BILMA waste treatment plant upgrade and the laying of the reclaim water lines in both Districts, two Board members attended a presentation by Masuen Consulting, https://www.masuenconsulting.com, at an AWBD summer conference on the advantages of not only using reclaim water for irrigation but, to

do so using a remotely managed smart controller system, instead of just tying a new reclaim water line into existing, off the shelf, standard, irrigation controllers, to irrigate in a more efficient manner saving more than just the difference in treated water vs reclaim water for irrigation but to irrigate with fewer gallons, only when needed to do so, and requiring less labor to manage the system. That presentation led the Board to interview Masuen on what they could offer the District to achieve our objectives. That presentation led the Board to select Masuen as the consultant for the District's phase II project, to design and oversee the installation of smart controller reclaim irrigation system and to manage it for the District at go live. See Image 1 for the selected controller, Baseline 3200 Smart Controllers.

Image 1. Baseline 3200 Smart Controllers at one of the pump stations.

Masuen's design documents detailing the specific requirements for each of the areas to be irrigated are all similar in nature. The only difference is the amount of material required for each area. Exhibit 4 is an example of one of those design documents.

The heart of the system consists of,

1. Five Baseline 3200 Smart Controllers, https://www.hydropoint.com/baseline/products/upgrade-to-basestation-3200s/
2. HDPE water lines, https://www.seilerpc.com/5-reasons-to-choose-hdpe-pipes-for-irrigation-systems
3. Rainbird Rotary Spray Heads, https://store.rainbird.com/1806prs-6-in-1800-series-prs-spray-head-no-nozzle.html?srsltid=AfmBOorjDdjtJPLdb14W654FkUGMValCikRpUkrCu6sh7w8BeqlPEhop
4. Four Watertronics 5000 Booster Pumps, https://watertronics.com/solutions/landscape-pumping-systems/watermax-series-for-landscape/watermax-5000-for-landscape/
5. Masuen Consulting, LLC being selected to remotely manage the system for the District, https://www.masuenconsulting.com/

The URLs for the five items above detail at length the benefits for each.

Methodology

Project Description

The contractor's project quote, approved and accepted by the Board was $1,995,631.27, amount billed to date by the contractor and paid less retainage is $883,924.41. The balance due after adjustments for scope and material changes less retainage and agreed to by all parties will be billed by the contractor upon completion of the punch list items.

The MUD Board meets once a month to sign checks, assuming the contractor submits his final bill in time for the District's engineers and consultant to review, sign off, submit to the District's bookkeeper for processing, and the Board reviews and signs the check, the final payment to the contractor, less retainage, will be made on Thursday July 18, 2025. The retainage amount will subsequently be paid to the contactor per the agreed upon terms.

Reference attached Exhibit 2, District reclaim irrigation project map

The original GANTT timeline developed by the District's engineers in coordination with the project contractor, Junction Landscaping was originally agreed to be 5/20/2024-10/25/2024. Electric service delays added six months to the schedule.

Reference attached Exhibit 1

Project Plans

The project began in June 2024 with the installation of piping and electrical conduits. In August, Harris County Engineering temporarily shut down Junction Landscaping's work on the T C Jester corridor until they received additional information regarding the permit, traffic control plan, and more detailed information regarding the irrigation line layouts. Junction was able to move their work crew onto the District's Terravista Detention Pond and soccer field until the county allowed them to restart on the T C Jester corridor and the five booster pumps, critical to keeping the required water pressure, have arrived on site for installation.

By December, Junction Landscaping completed installation of all water lines, irrigation lines, spray heads, valves, all wiring, and the 5 booster pumps, and Centerpoint completed installation of 5 new utility poles. After the installation of the electric meters by Centerpoint, Junction installed the smart controllers, the brains of the system, next to the booster pumps and make the electric connections effectively completing the project. Image 2 shows one of the booster pumps at Bill Lloyd park. The final step is to inspect the lines and check for leaks. Repairs and adjustments will be made to ensure proper irrigation to maintain the integrity of the landscape and reduce water runoff.

Image 2. Booster pump installation at Bill Loyd Park.

Results

Data Collected

Masuen, the District's consultant's original analysis projected an annual water saving of 3 million gallons annually. It should be noted this saving includes areas not previously irrigated. The analysis also found

the community's common areas used roughly 58% more water than is needed. In spite of this overuse, large areas of the landscape observed was stressed and showed signs of a long-term lack of irrigation. Masuen Consulting projected that the irrigated landscape area can be irrigated with 63% of the water currently being used. With the system using reclaim water at the estimated cost of $2.50 per thousand gallons, there's an estimated annual savings of $9,897. However, with the previous system that was on potable water at $6.05 per thousand gallons, the potential annual savings was $23,951. Figure 1 is representing the water usage for sprinklers in gallons from 2019 to 2023.

Reference attached Exhibit 3.

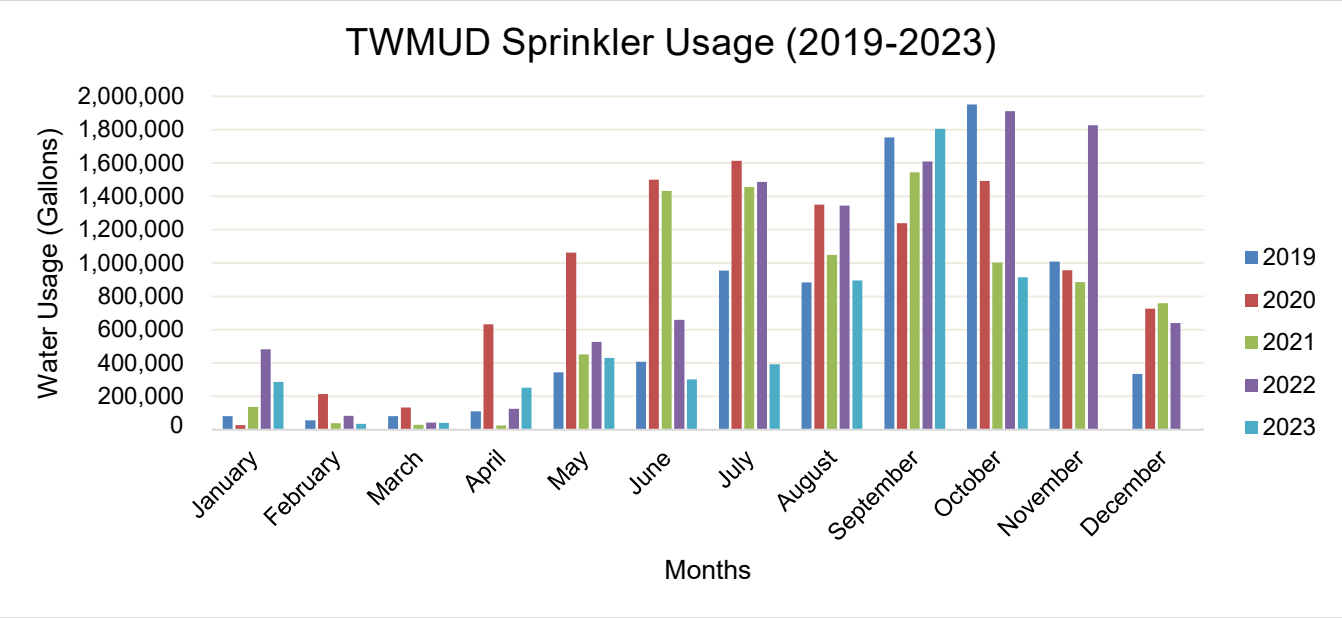


Figure 1. This graph displays the water usage data for sprinklers from 2019 to 2023.

Project Challenges, Lessons Learned, and Community Awareness

Knowing the District's Engineering company did not have in house expertise in the design of a remote managed smart controller system, the challenge was to find a consultant with the expertise to design the system, oversee the contractor during construction to insure the system was properly installed and one who could also manage the system working with the District's landscaper for the post go live. Masuen's expertise with all three was determined to be the perfect fit for the District.

The District's engineers, Baxter & Woodman's role would be that of project manager to create and manage the timeline, generate change orders and revisions, process contractor invoices, and overall manage the contractor which they are well qualified to do.

The lesson learned for the District had nothing to do with the system design and construction but more so with the District's engineers and contractors challenge understanding what it would take to have CenterPoint install new utility poles and transformers, assign ESID addresses for the new three new electric meter locations, allow time for CenterPoint to inspect and clear the contractor installed electric panels for service connection, and coordinate that with the District contracting with an electric service

provider. That challenge put the project six months behind schedule adding additional cost to the project and in additional to not being able to irrigate during construction.

Image 3. Fire hydrant at Bill Loyd Park, decorated as the purple toad mascot with signs promoting the project.

From the beginning, the Board made a point of communicating the benefits and project progress to residents by means of a District website tab, monthly newsletter updates, broadcast messages to our residents, a series of eye catching in ground signs placed along the walking trails in the MUD park and detention pond green space, adopting a purple toad (the official color of reclaim water) as the District's reclaim irrigation mascot, and decorating a display fire hydrant in the MUD park to resemble the purple toad mascot designed to catch of the eye of trail walkers (see image 3). All of this has helped to raise the awareness of reclaim irrigation with the District's residents. As we near go live.

Conclusion

Data Interpretation and Water Conservation Efforts

The District's consultant has already initiated remote service for the five controllers with Baseline, the manufacturer, created logon IDs for the District and its landscaper, and loaded zone information for each zone tied to the five controllers that the system's AI functionality will automatically use to create a day, time, and run time for each zone connected to each of the five smart controllers. The smart controller's AI functionality will automatically adjust the system as conditions change and Masuen can manually override and adjust any of the parameters based on input from the District's landscaper.

It's expected to take a couple of months to analyze water usage once the system goes live before actual savings vs projections can be reported.

Recommendations or Future Plans

Knowing what the Board knows now some three years after the decision to move forward with the project, would the Board do it all again? Absolutely, even with the unexpected delay.

While the District will never recover the total cost to implement the project, that was never the intent. The purpose of the project is to reduce the use of treated fresh water for irrigation within the District and reduce the operational costs to manage reclaim irrigation.

The Board is confident we'll meet both of those objectives and is more than happy to speak to the benefits of reclaim irrigation and smart controller management to any District interested in hearing about the District's project.

The Board would highly recommend any District considering a reclaim irrigation project, not to tie a new reclaim water line to existing standard irrigation controllers but to hire an expert in reclaim irrigation design and management the system and with remote management experience.

As for future plans, the District could consider expanding the system to include the Terranova West POA clubhouse common area but it's highly unlikely the cost vs benefit would justify this expansion.

After the system is turned on and enough time is given to insure everything is running as expected, the District does have agreements to supply reclaim irrigation water with two commercial accounts within the District and a Homeowners Association bordering the District. These three accounts, when added to the system, will result in an additional reduction in treated water for irrigation that was not included in the original analysis as the agreements were not in place at that time. (Image 4 shows a purple pipe along a detention pond to indicate a spray head to avoid while mowing.)

Image 4. Purple pipe coming out of the ground at detention pond to indicate to landscapers of spray heads to avoid when mowing.

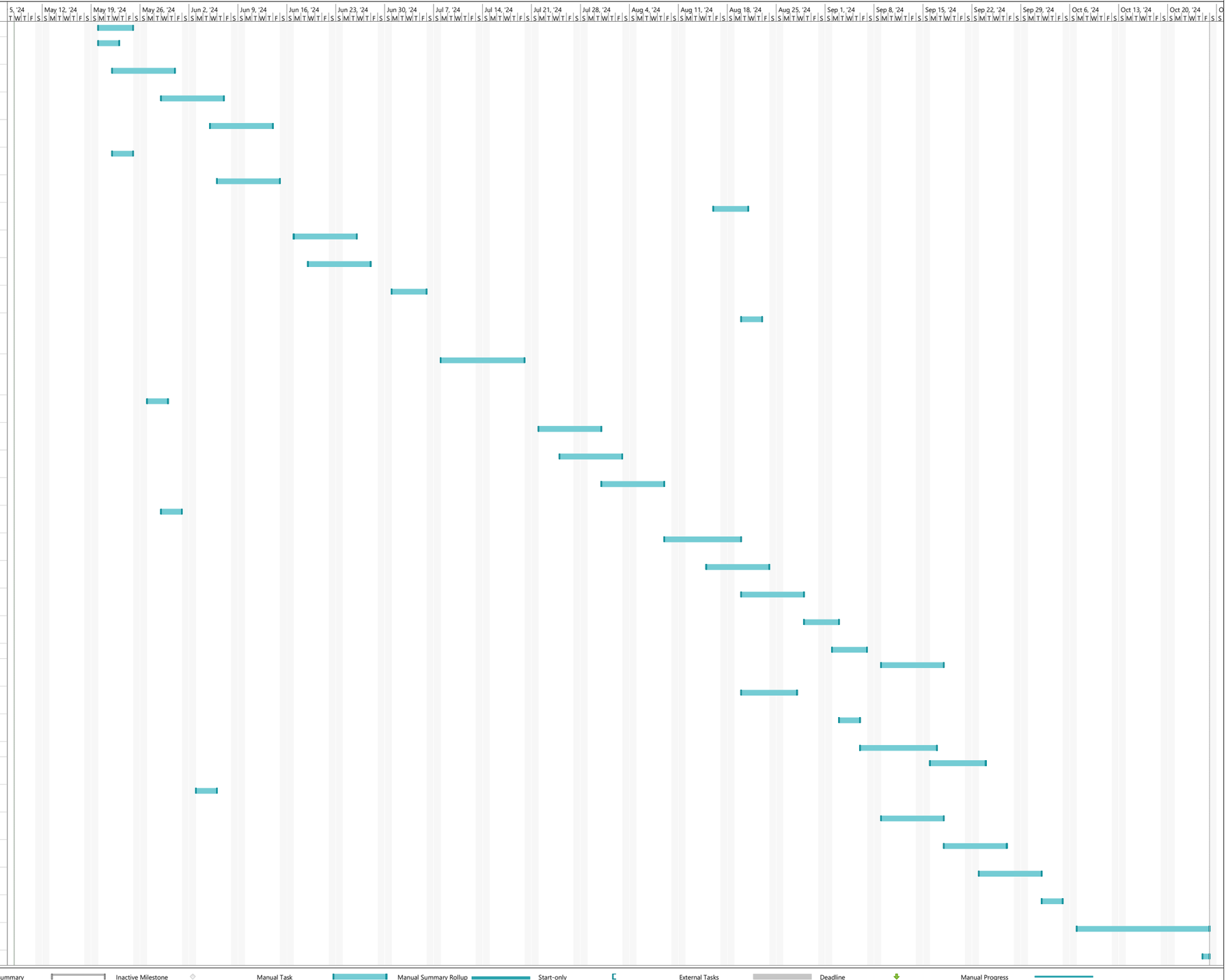
References

Masuen Consulting LLC, the Board finds Masuen to be very professional, well versed in reclaim water for irrigation design, an experienced, motivated staff, able to quickly adapt to unexpected changes, and a pleasure to work with. The Board looks forward to a long relationship with Masuen.

EXHIBIT 1

Terranova Project Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		Mobilization	5 days	Mon 5/20/24	Fri 5/24/24		
2		Phase one TC Jester Mainline Bore	3 days	Mon 5/20/24	Wed 5/22/24		
3		Phase one TC Jester Mainline	7 days	Wed 5/22/24	Thu 5/30/24		
4		Phase one TC Jester Valves	7 days	Wed 5/29/24	Thu 6/6/24		
5		Phase one TC Jester Laterials	7 days	Wed 6/5/24	Thu 6/13/24		
6		Phase two TC Jester Mainline Bore	3 days	Wed 5/22/24	Fri 5/24/24		
7		Phase two TC Jester Mainline	7 days	Thu 6/6/24	Fri 6/14/24		
8		Phase two TC Jester Booster Pump Install	3 days	Fri 8/16/24	Tue 8/20/24		
9		Phase two TC Jester Valves	7 days	Mon 6/17/24	Tue 6/25/24		
10		Phase two TC Jester Laterials	7 days	Wed 6/19/24	Thu 6/27/24		
11		Terravista Detention Pond Main Line	5 days	Mon 7/1/24	Fri 7/5/24		
12		Terravista Detention Pond Booster Pump Install	3 days	Tue 8/20/24	Thu 8/22/24		
13		Terravista Detention Pond Laterials & Valves	10 days	Mon 7/8/24	Fri 7/19/24		
14		Phase three TC Jester Mainline Bore	3 days	Mon 5/27/24	Wed 5/29/24		
15		Phase three TC Jester Mainline	7 days	Mon 7/22/24	Tue 7/30/24		
16		Phase three TC Jester Valves	7 days	Thu 7/25/24	Fri 8/2/24		
17		Phase three TC Jester Laterials	7 days	Wed 7/31/24	Thu 8/8/24		
18		Phase four TC Jester Mainline Bore	3 days	Wed 5/29/24	Fri 5/31/24		
19		Phase four TC Jester Mainline	7 days	Fri 8/9/24	Mon 8/19/24		
20		Phase four TC Jester Valves	7 days	Thu 8/15/24	Fri 8/23/24		
21		Phase four TC Jester Laterials	7 days	Tue 8/20/24	Wed 8/28/24		
22		Soccer Field Mainline	3 days	Thu 8/29/24	Mon 9/2/24		
23		Soccer Field Valves	5 days	Mon 9/2/24	Fri 9/6/24		
24		Soccer Field Laterials	7 days	Mon 9/9/24	Tue 9/17/24		
25		Park Project Booster Pump Install	6 days	Tue 8/20/24	Tue 8/27/24		
26		Park Project Mainline	3 days	Tue 9/3/24	Thu 9/5/24		
27		Park Project Valves	7 days	Fri 9/6/24	Mon 9/16/24		
28		Park Project Laterials	6 days	Mon 9/16/24	Mon 9/23/24		
29		Cypresswood Dr. Bore	3 days	Mon 6/3/24	Wed 6/5/24		
30		Cypresswood Dr. Mainline	7 days	Mon 9/9/24	Tue 9/17/24		
31		Cypresswood Dr. Valves	7 days	Wed 9/18/24	Thu 9/26/24		
32		Cypresswood Dr. Laterials	7 days	Mon 9/23/24	Tue 10/1/24		
33		Final Completion Walk	3 days	Wed 10/2/24	Fri 10/4/24		
34		Punch List Corrections	15 days	Mon 10/7/24	Fri 10/25/24		
35		Final	1 day	Fri 10/25/24	Fri 10/25/24		



Project: Terranova Project Sche
Date: Wed 5/8/24

Task, Split, Milestone, Summary, Project Summary, Inactive Task, Inactive Milestone, Inactive Summary, Manual Task, Duration-only, Manual Summary Rollup, Manual Summary, Start-only, Finish-only, External Tasks, External Milestone, Deadline, Progress, Manual Progress

Junction Landscape

EXHIBIT 2

TERRANOVA WEST MUD

IRRIGATION SYSTEM ZONES

SCALE: 1"=200' **JANUARY 2025**

PREPARED BY

BAXTER & WOODMAN Consulting Engineers

11450 COMPAQ CENTER WEST DRIVE, SUITE 660
HOUSTON, TEXAS 77070 • (281)350-7027
www.baxterwoodman.com • TBPELS FIRM No. F-21783

LEGEND

- SECTION BOUNDARY
- DISTRICT BOUNDARY
- TC JESTER & TERRANOVA WEST DRIVE
- MUD PARK
- CYPRESSWOOD DRIVE
- SOCCER FIELD
- TERRAVISTA DETENTION POND

ZONE X

ZONE AE

ZONE X

ZONE X

ZONE X

ZONE AE

ZONE X

TC JESTER BOULEVARD

LOUETTA ROAD

CIRCLE K

KISSING TREE PARK

ACREAGE

THE PALMS OFFICE PARK

60' INGRESS AND EGRESS ESMT. H.C.C.F. NO. T-219269

33' ARCO PIPELINE ESMT

50' MOBILE PIPELINE ESMT

60' WIDE PRIVATE ROADWAY ESMT HCCF NO F-348183

CALLED 1.203 AC COBBLESTONE CONSTRUCTION, INC HCCF T-231542

RESTRICTED RESERVE "H" 6.1718 ACRES 268,847 SQ FT (RESTRICTED TO DETENTION USES)

TERRAVISTA SECTION 1

TERRAVISTA SECTION 2

TERRAVISTA SECTION 3

TERRAVISTA SECTION 4

TERRAVISTA SECTION 5

ESTATES OF TERRANOVA WEST

TERRANOVA WEST DRIVE

TERRAVISTA MANOR

WALCOTT MILLS DRIVE

GRAYMOOR HILLS

HARPOST MANOR

STOCKTON SPRINGS DRIVE

SILVERTHORN GLEN DRIVE

SUMMERFIELD LANE

WOODVILLE LANE

ASHMERE LANE

LACREEK LANE

NODAWAY LANE

GLENMERE LANE

SPRINGTON LANE

BRYANHURST LANE

COBBLE LANE

ALAMOSA LANE

DUNLEITH LANE

BRAXTON GROVE LANE

LAYTON MEADOWS LANE

OAKDALE MEADOWS

SHELDON PINES

NORWOOD OAKS

CRESTON SPRINGS CT.

FULTON POINT DR.

MOSS POINT COURT

ASPHODEL COURT

SLASHWOOD LANE

WATER PLANT SITE

STRACK FARM RD.

CL SPRING GULLY

DETENTION POND

GREEN ELM LANE

SHADY ARBOR LANE

ENGLISH IVY LANE

BURNT LEAF LANE

THE OAKS

GLENMERE DRIVE

TERRAVITA DRIVE

MILANO LANE

VIAMONTE LANE

RAVENNO LANE

SURREYWEST LANE

WOODLODE LANE

TREELOCH LANE

OAKSHAM LANE

WINDTREE LANE

ROUTHLAND DRIVE

MACRANTHA DRIVE

BROWN LEE LANE

MACRANTHA COURT

TERRANOVA WEST DRIVE

RECREATION SITE

BILL LOYD PARK

CYPRESSWOOD DRIVE

45' ROADWAY & UTILITY ESMT

CYPRESS CREEK

NORTHGATE FOREST COUNTRY CLUB

69' ROADWAY ESMT

Q:\TERWT\District Maps\Utility Overall\CAD\TERWT Utility Overall.dwg, 1/14/2025 2:28:24 PM, bob juliano

EXHIBIT 3

Terranova West MUD

IRRIGATION WATER USE PROJECTION

Masuen Consulting LLC

Design Consult Manage

MASUENCONSULTING.COM 866.928.1533

Contents

Introduction

Terranova West MUD is located outside of Spring, Texas, north of Houston. The district has a desire to conserve and use water wisely to best serve its customers while maintaining a healthy and attractive landscape. To that end, the district retained Masuen Consulting to perform a water use analysis for common areas of the community that will be on the reuse water supply.

Terms and Assumptions

Terms specific to a Masuen water use assessment

Usage Estimate: Estimate of future water use based on historical site-specific water meter data and the specific irrigated area. Areas currently no irrigated have been added to this report and will impact the projected water usages number and savings.

Demand: Estimate of future water use based on irrigation best management practices, and realistic site-specific irrigation efficiency for the specific irrigated area. Area from the soccer field, the baseball field and the Terravista detention pond were included to project what the demand will be once those areas are added to this project.

Site Specific Assumptions

Evapotranspiration (ET): This was gathered from the Texas A&M TexasET Network. Houston historical data was used. This site uses an average of the last 31 years. This reflects general drying of the landscape.

Rainfall: This data was retrieved from the same place and using the same weather station as the ET.

Irrigated Area: Derived from the map and information provided by the District. The total current irrigated area is 8.7 acres.

Landscape Coefficient: This factor represents plant type, plant density and microclimate. For this analysis a standard of 0.7 was used.

System Efficiency: This factor represents the efficiency of the irrigation system. For this analysis 0.63 for the common areas and the lots was utilized.

Historical Usage: Five years' worth of historical usage was provided by the district and that was the basis of our historical usage numbers. The provided data covered all of 2018, 2019, 2020, 2021 and 2022. In conversation with Tom Lovell he warned us that at times controllers would be turned off or cut back to limit water use, letting the landscape become stressed. It was agreed that we would look for usage anomalies and adjust those meters back into the normal usage realm. To accommodate this, we reviewed each controller by year and changed the flow from

gallons into a percentage of the total use for the year. We then averaged those percentages by month across the controllers. Any individual controller/month that was 33% or more under the average was boosted up to the average and then converted back to gallons. This took the yearly average usage from 7 million gallons a year to 7.8 million gallons per year.

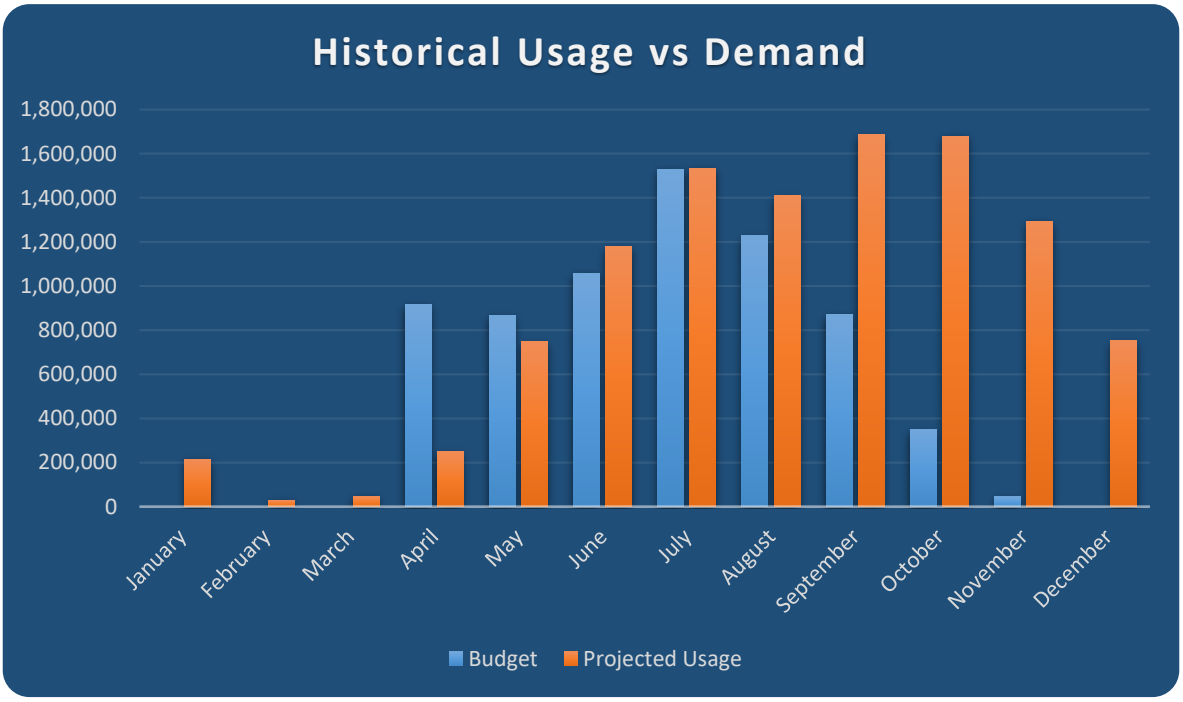
Abstract

The result of this analysis found the community's common areas included in this analysis use roughly 58% more water than is needed. In spite of this overuse, large areas of the landscape we observed to be stressed and showed signs of a long-term lack of irrigation.

Irrigation water use analysis

Comparing historical water use to base demand

This chart shows a typical overuse of water. Of note in this chart is the high usage late in the irrigation season. It appears that once the irrigation is set for the summer it is not adjusted back down in the fall.



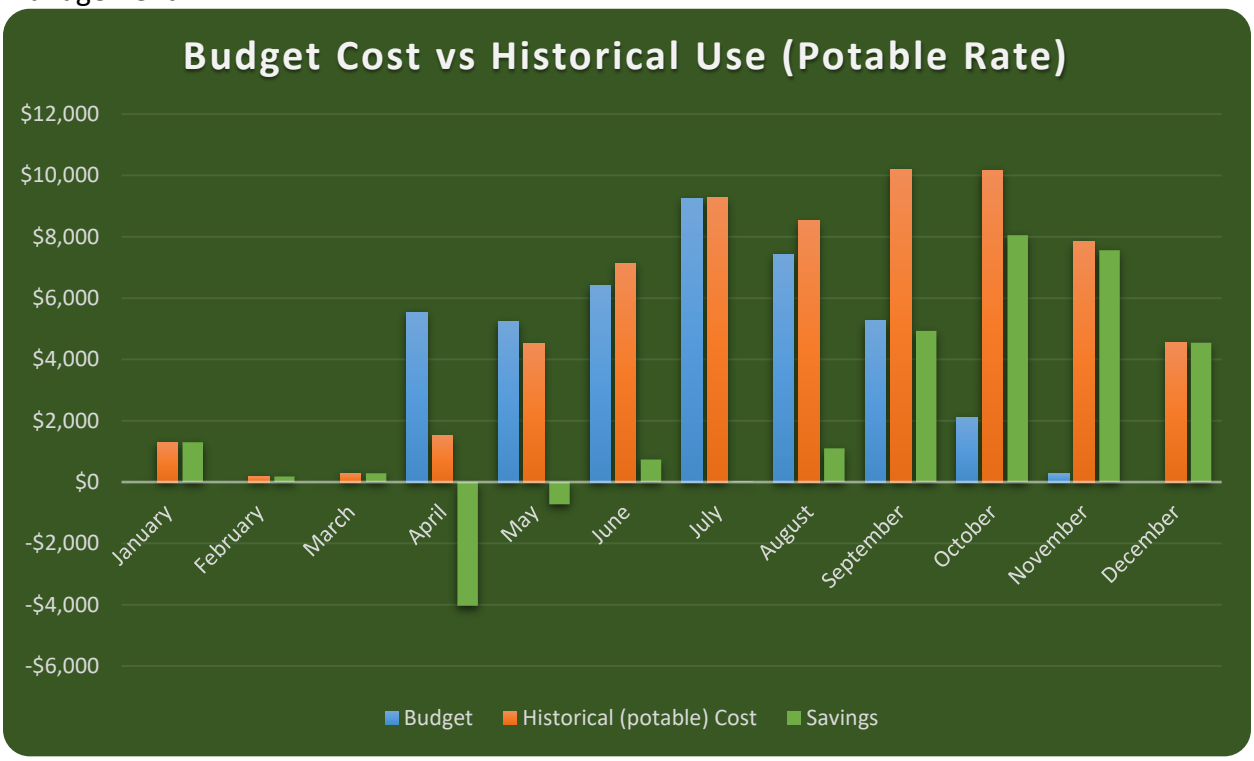
Summary

Water Savings

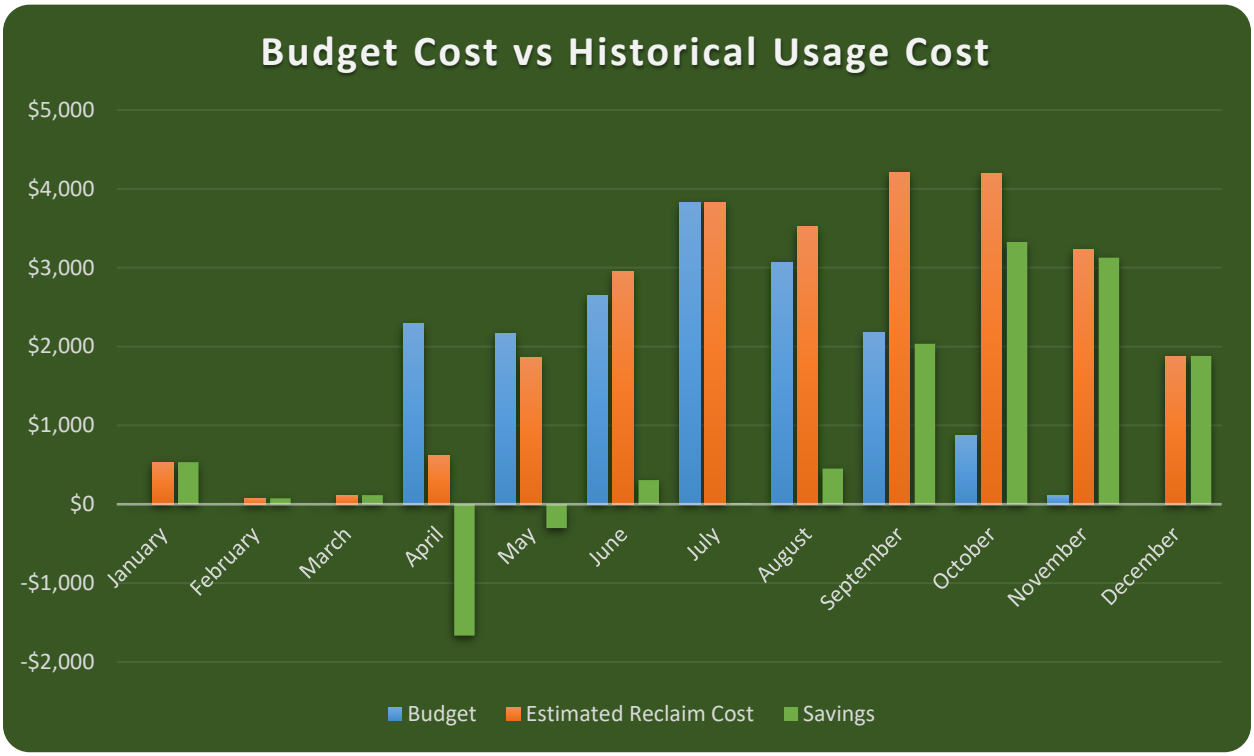
It was determined that the district could save 3 million gallons per year during a normal weather year with a professionally designed and installed irrigation system, proper maintenance and professional management.

Monetary Savings

With the current situation of using potable water at $6.05 per 1,000 gallons, it was determined that the association could save $23,951 per year during a normal weather year with a professionally designed and installed irrigation system, proper maintenance and professional management.



Looking forward to when the system has migrated to reclaim water and using the estimated cost of $2.50 per thousand gallons, we show a savings of this $9,897. This chart breaks that out by month:



Conclusion

Based on the data provided, Masuen Consulting has projected that the irrigated landscape area contained in the analysis can be irrigated with 63% of the water currently being used.

Reducing irrigation water by this amount will take a good irrigation system, diligent maintenance, and careful management and monitoring. Achieving this level of management will first require gathering detailed information on all irrigated areas in order to develop meter level usage caps that can be managed to. Maintaining reduced water use each year will require ongoing monitoring and system maintenance and carful adherence to stringent irrigation specifications.